

REMARKS

In the present Office Action, claims 1 -20 were examined. Claims 1 – 14 are rejected, and claims 15-20 are withdrawn and no claims are allowed. By this Amendment, claim 1 has been amended, no claims have been canceled, and claim 21 has been added. Accordingly, claims 1-14 and 21 are presented for further examination. No new matter has been added. By this Amendment, claims 1-14 and 21 are believed to be in condition for allowance.

The Examiner requested restriction between the claims of Group I (claims 1-14) drawn to a copper foil laminate, classified in class 428, subclass 607 and Group II (claims 15-20) drawn to a method for manufacturing a printed circuit board, classified in class 427, class 96. On February 28, 2005 Applicants' attorney made a provisional election to prosecute the claims of Group I. Applicants affirm the election of Group I, claims 1-14 and traverse the restriction requirement.

Applicants acknowledge that the copper foil embodied in claim 1 may be formed into a printed circuit board by a method other than that embodied in claim 15 and may also have applications other than in a printed circuit board. However, the method embodied in claim 15 contains a specific step (a); coating the copper foil with a laser ablation inhibiting layer that is effective to provide a reflectivity value of at least 40 to the coated copper foil and that is effective to provide a lamination peel strength to FR-4 of at least 4.5 pounds per inch. Accordingly, any search of the method steps of claim 15 would necessarily include a search of the copper foil embodied in claim 1. Therefore, the search of the two groups of claims is at least partially co-extensive and the Examiner would not be unduly burdened to consider all claims on their merits at the same time.

Removal of the restriction requirement and consideration of all pending claims on their merits is respectfully requested. If the Examiner repeats the restriction requirement and makes in Final, Applicants reaffirm the election Group I, claims 1-14.

The claims were objected to as they recite "pounds per inch" instead of "pounds per square inch". The Applicants respectfully traverse the Examiner's objection. Specifically, the Applicants direct the Examiner's attention to page 9 lines 26-32 and the examples of the present specification where the IPC-TM-650 test method is described. The IPC-TM-650 test method is described in detail in the document entitled "Institute for

Interconnecting and Packaging Electronic Circuits, IPPC-TM-650 Test Method,” which was cited by the Applicants in an Information Disclosure Statement on May 20, 2004. The Applicants note that pursuant to the IPC-TM-650 test method, the peel strength is calculated by dividing the load by the strip width, and is expressed in pound per inch units. Therefore, the Applicants respectfully request that the objection be removed.

Claims 1-14 were rejected under 35 U.S.C. §103(a) as being unpatentable over Lin et al. (U.S. Patent No. 5,071,520) in view of Mori (U.S. Patent No. 6,703,564). The Lin et al. reference discloses that a foil, if desired, may be rinsed and then subjected to a zinc plating treatment. The plating treatment may be used to apply a coating of zinc to the roughened or dendritic side of the foil. The coating may be between 0.3 to about 3.0 g/m². The zinc plating may be applied utilizing a plating solution including a suitable form of zinc, such as in the form of zinc sulfate. (See column 3, lines 40-48). This treatment is described in the current specification at page 2, lines 19-27. Additionally, Lin et al. discloses an antitarnish treatment which comprises electrolytically depositing chromium and zinc ions on the foil.

Mori discloses a printed wiring board formed by a printed wiring substrate having a plurality of wiring layers and a thermal expansion buffering sheet having a lower coefficient of thermal expansion than that of the wiring substrate. At column 3, lines 39-46, Mori discloses bonding the thermal expansion buffering sheet to the laminated substrate. On both sides of the thermal expansion buffering sheet wiring patterns are provided. In the wiring pattern, via holes are formed on the thermal expansion buffering sheet by laser.

As recited in amended claim 1 of the present application, Applicants’ copper foil is coated with a laser ablation inhibiting layer. The laser ablation inhibiting layer has an average reflectivity value of at least 40 that is effective to provide a lamination peel strength to FR-4 of at least 4.5 pounds per inch.

There is nothing in the Lin et al. or the Mori reference to teach or suggest a copper foil for lamination to a dielectric substrate, where the copper foil is coated with a laser ablation inhibiting layer having an average reflectivity value of at least 40 that is effective to provide a lamination peel strength to FR-4 of at least 4.5 pounds per inch.

While Lin et al. discloses an antitarnish treatment comprising electrolytically depositing chromium and zinc, it does not teach or suggest a laser ablation inhibiting layer

that inhibits or prevents ablation of the copper transforming the desired blind via into a through hole via. Additionally, such a layer having a reflectivity value of at least 40 is not disclosed or suggested by the Lin et al. or Mori references. To the contrary, the Lin reference discloses a process to improve peel strength by electrolytically forming a plurality of dendrites on the surface of the foil and subjecting the foil to a rinse in an aqueous solution containing an effective amount of a silane coupling agent. The dendritic treatment in combination with the silane treatment results in improved peel strength properties. (See col. 4, lines 46-49). While the peel strength disclosed in Lin et al. is at least 7 lbs/inch, it is noted that to achieve such a peel strength, the surface roughness of the foil is necessarily increased. Note the background section of Applicants specification at page 2, lines 13-18 which states that decreasing the surface roughness compromises the peel strength between the copper foil and the dielectric substrate. This is in contrast to the Applicants' present invention wherein a high adhesion between copper foil and a dielectric substrate is generated even when smooth copper foil is used. Neither Lin et al. nor Mori disclose or suggest manipulating or controlling the surface roughness, surface profile or reflectivity to achieve an improved peel strength. Accordingly, claim 1-14 are allowable over Lin et al. and Mori.

New claim 21 has been added to depend from claim 1. New claim 21 recites the laser ablation inhibiting layer of the present invention has an average surface roughness of less than 1 micron. Support for this claim can be found in the present specification at least at page 10, lines 25-27. Applicants submit that neither the Lin et al. reference nor the Mori reference discloses or suggests a copper foil with a laser ablation inhibiting layer having an average surface roughness of less than 1.0 micron. As stated above, Neither Lin et al. nor Mori disclose or suggest manipulating or controlling the surface roughness, surface profile or reflectivity to achieve an improved peel strength. Accordingly, new claim 21 is allowable over the Lin et al. and Mori references.

Claims 1-14 were provisionally rejected under the judicially created doctrine of obviousness type double patenting as unpatentable over claims 1-14 of co-pending U.S. Application No. 10/779,940 and claims 1-5 of co-pending U.S. Application No. 10/727,920. To overcome this provisional rejection, the Applicants herein submit a terminal disclaimer disclaiming the terminal part of any patent granted on the present

application which would extend beyond the normal expiration of any patent granted on U.S. Application No. 10/779,940 and U.S. Application No. 10/727,920.

Both the present application and U.S. Application Nos. 10/779,940 and 10/727,920 are assigned to Olin Corporation. Accordingly, Applicants submit that the present provisional rejection has been overcome and respectfully request the Examiner withdraw the provisional double patenting rejection.

Accordingly, Applicants submits that none of the references, alone or in combination, anticipate or make obvious the invention as presently claimed and that the application is now in condition for allowance. If the Examiner considers that an additional amendment is required to place the application in condition for allowance, he is invited to contact Applicant's attorney at the telephone number listed below.

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Respectfully submitted,
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